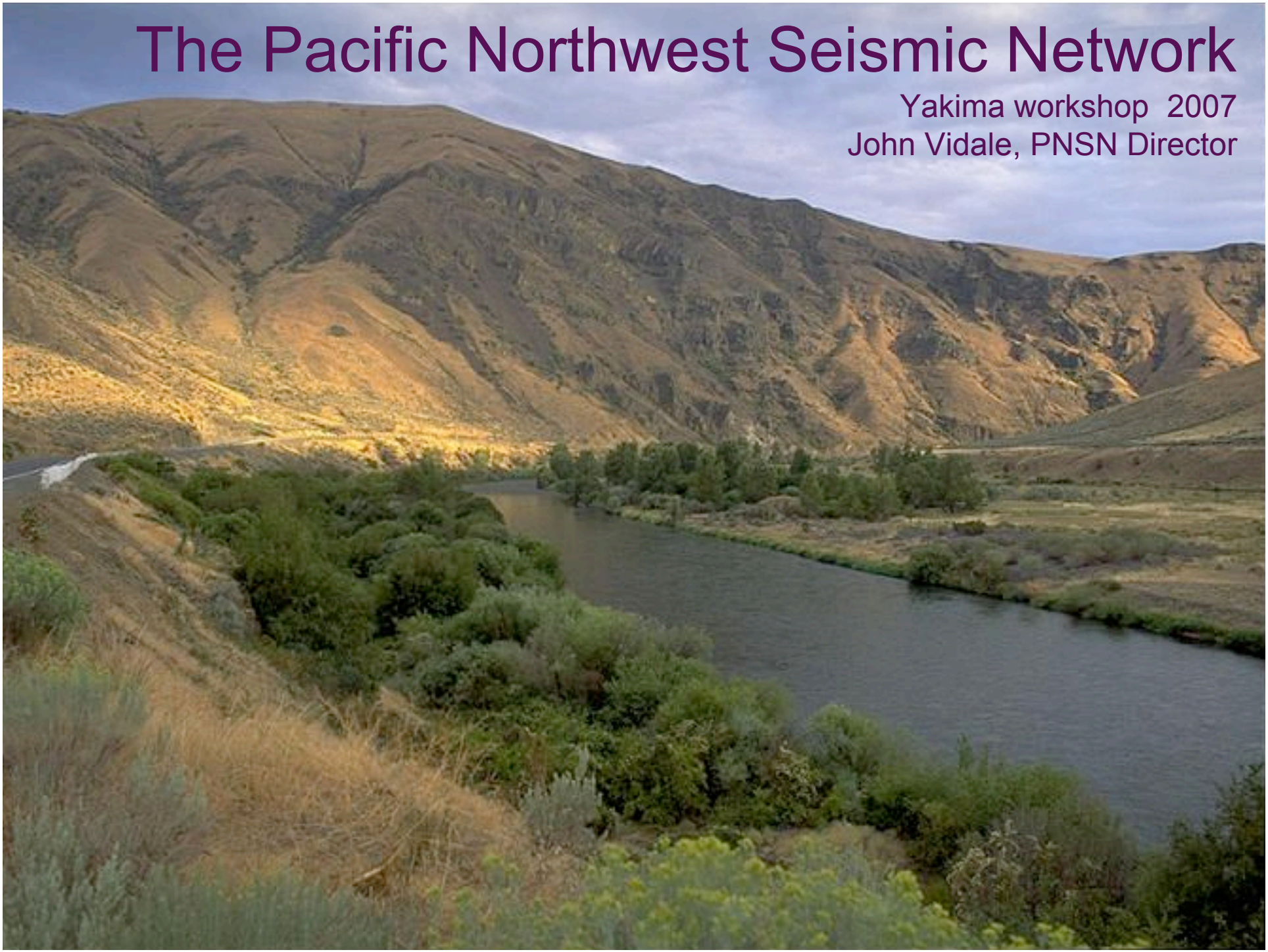
The Pacific Northwest Seismic Network

Yakima workshop 2007
John Vidale, PNSN Director



Brief review

- Who we are
- Tectonic setting
- Our monitoring tools
- Our products and how to use them
- Long-range efforts

Operational Personnel

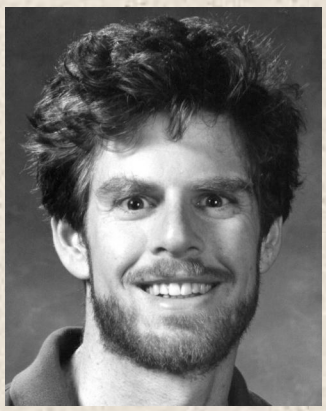
***John Vidale**, PNSN Network Director*

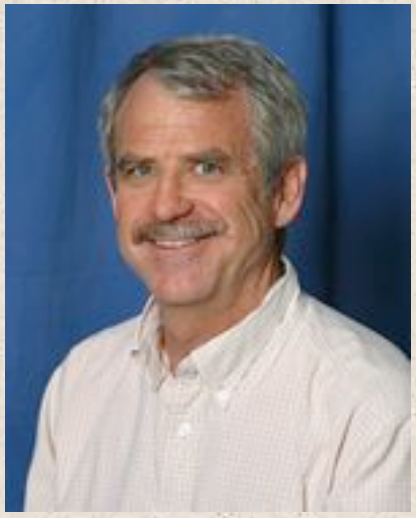
***Paul Bodin**, PNSN Network Manager*

***Steve Malone**, Consulting Director*

***Bill Steele**, Seismo Lab Coordinator*

***Craig Weaver**, USGS*



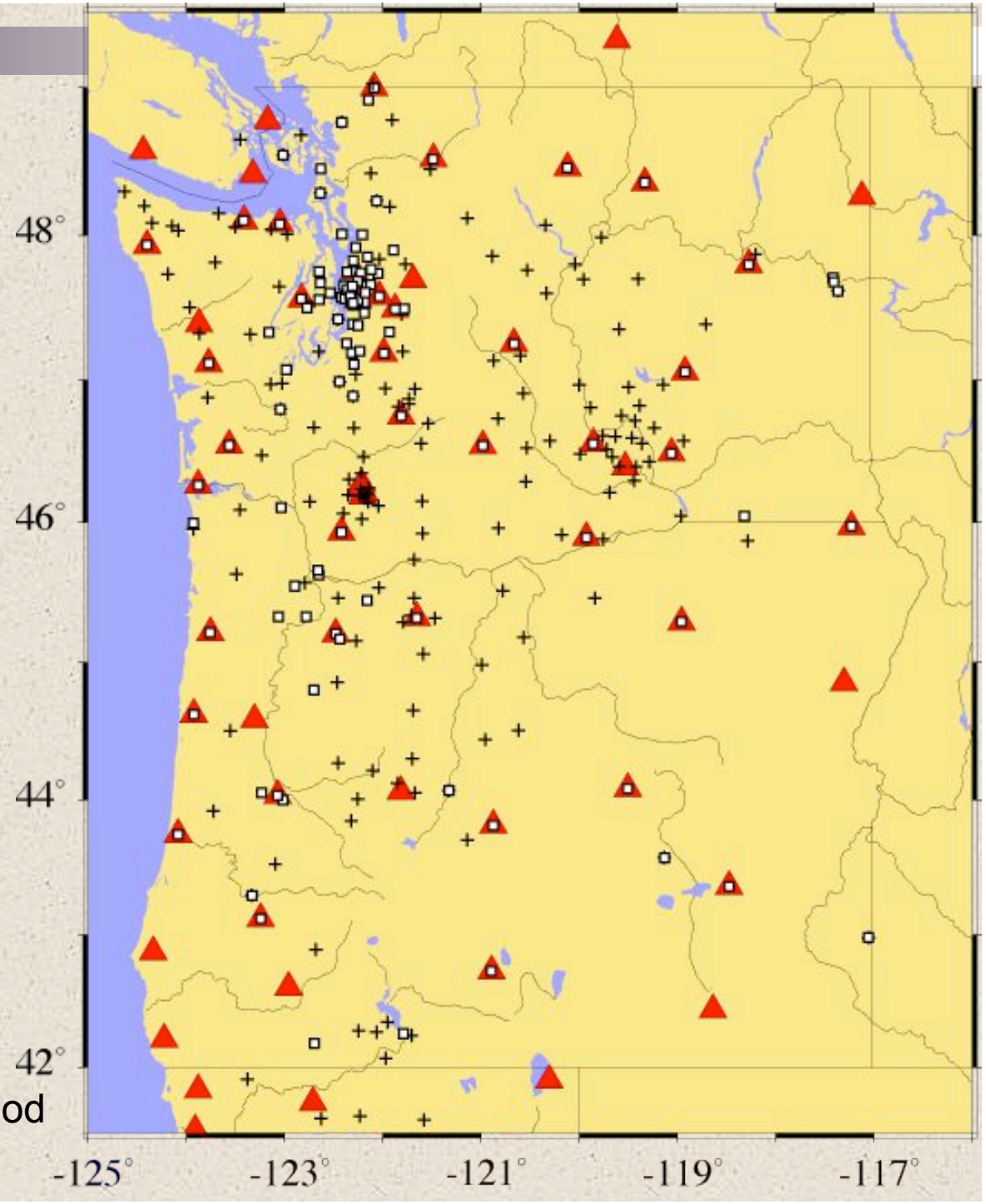


Seismologists : Joan Gomberg , Ruth Ludwin

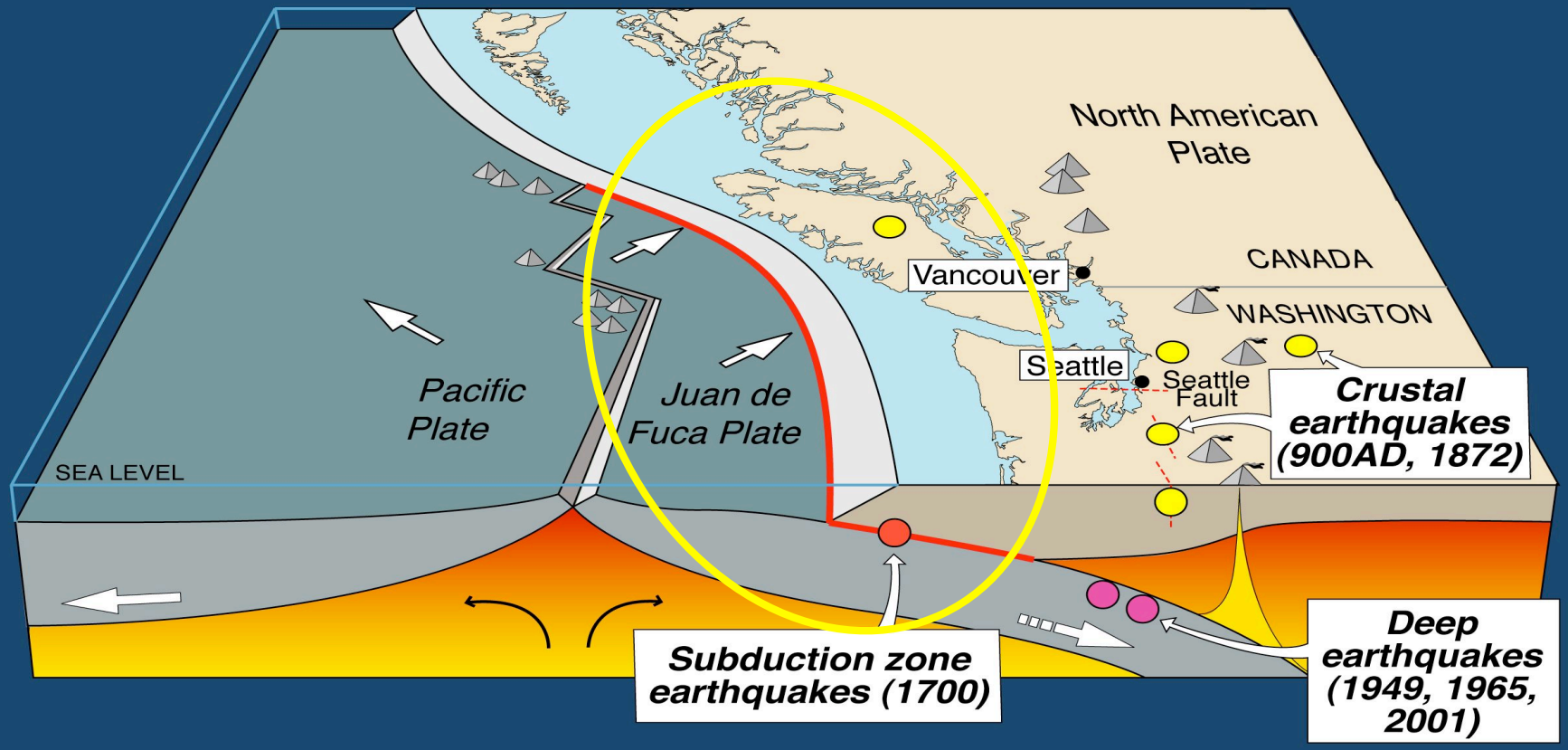
Plus staff and technicians : Renate Hartog, Tom Yelin

PNSN seismometers

- **U of Washington**, *Seattle, WA*
  - Operations and regional center
- **USGS, Cascade Volcano Observatory**, *Vancouver, WA*
  - Works on Mt St Helens and coordinates volcano monitoring
- **NSF, IRIS DMC,** *Seattle, WA*
  - Archives data
- **U of Oregon**, *Eugene, OR*
  - Maintenance of stations in southern Oregon
- **Pacific Northwest Laboratory**, *Richland, WA*
  - Operates stations in eastern Washington

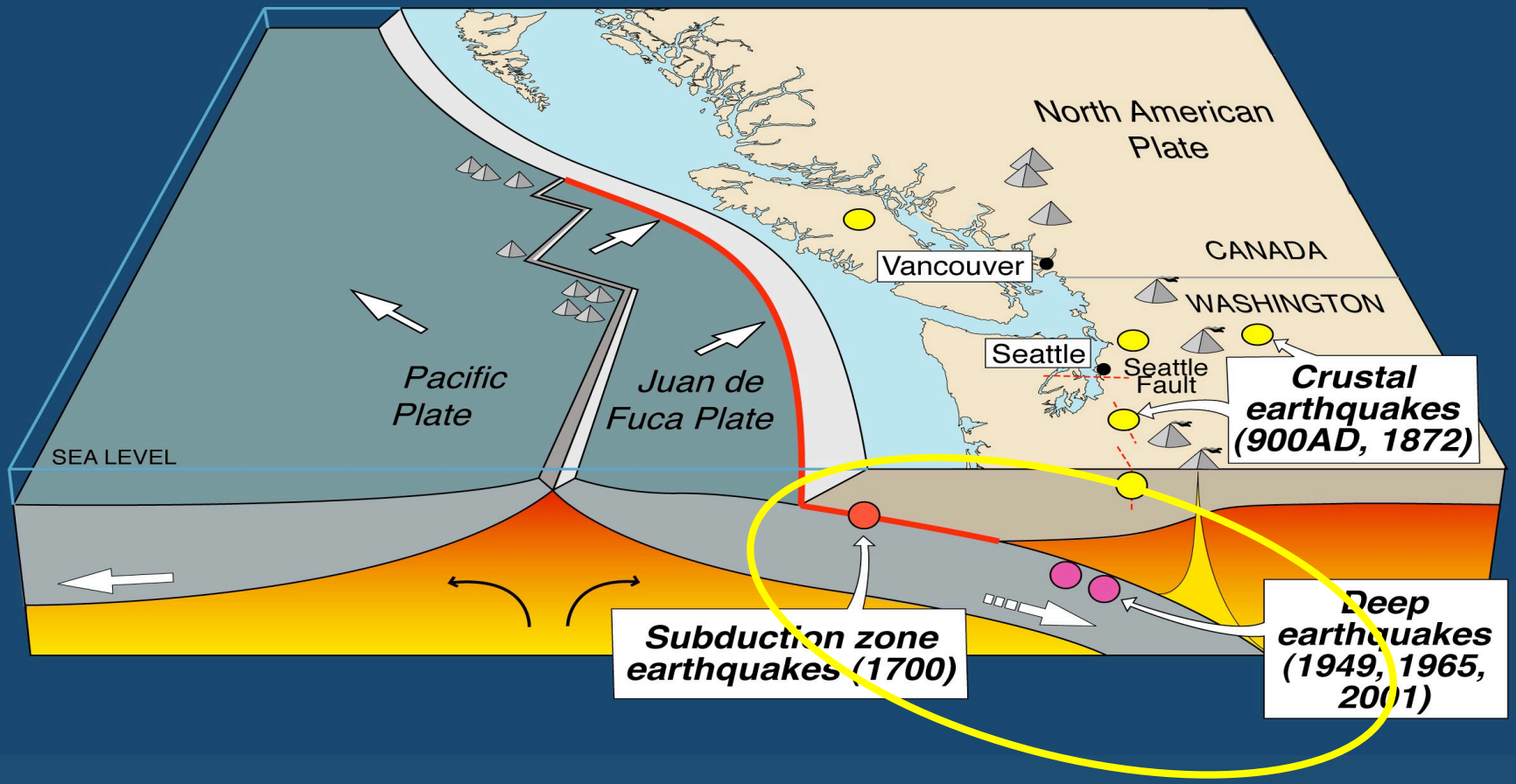


Cascadia earthquake sources



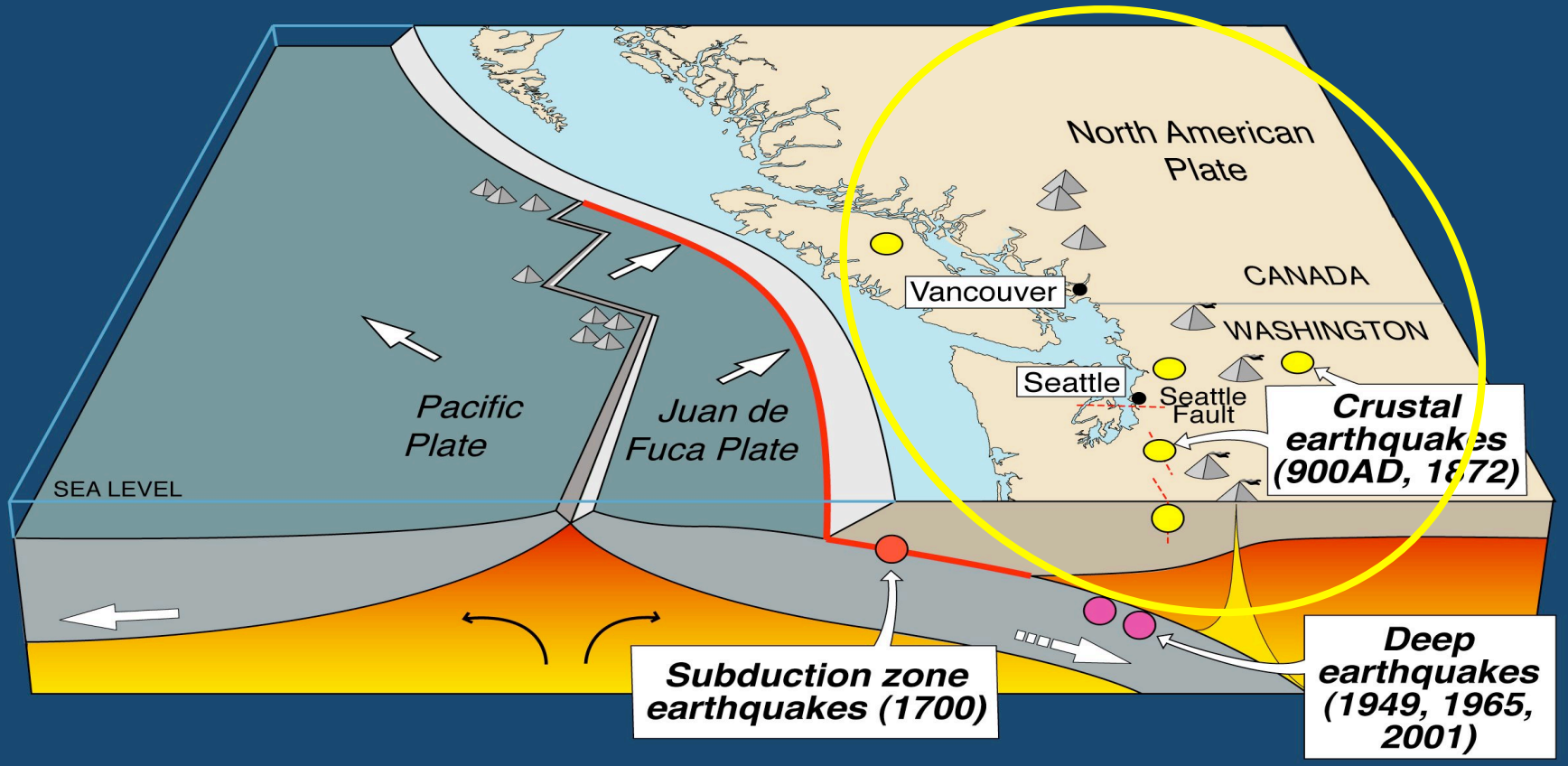
Subduction zone earthquakes are the ***Big Ones****, occurring where the downgoing plate is usually stuck.* *About 10% chance of* ***M9+ each 50 years.***

Cascadia earthquake sources

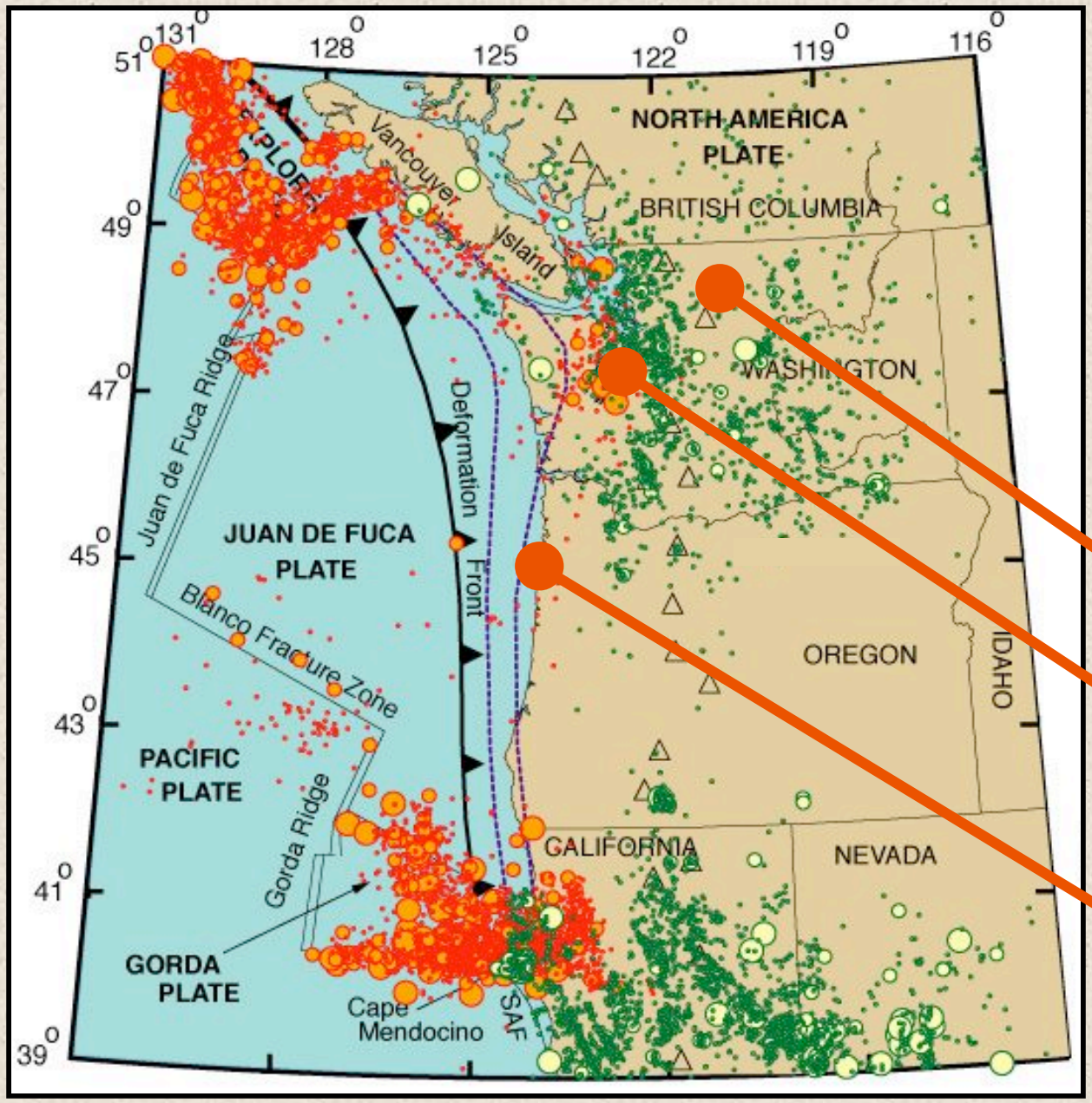


'Intraplate' (deep) earthquakes have been moderate in size & deep, occurring as the plate flexes on its way down. ***In a 50-year window, there's an 84% chance of an M6.5+ interplate earthquake.***

Cascadia earthquake sources



'Crustal' earthquakes *occur because* ***the crust is deforming****, as well as the subduction zone slipping and the plate flexing.* ***In a 50-year window, the chances are 5% & 15% of an M6.5+ earthquake on the Seattle fault & in the crust anywhere in the Puget Sound region, respectively.***



Green = N. American plate, Red = Juan de Fuca plate

Lots of little earthquakes.

Some big ones, too.

1872

2001, 1965, 1949

1700

Volcano Monitoring 24/7

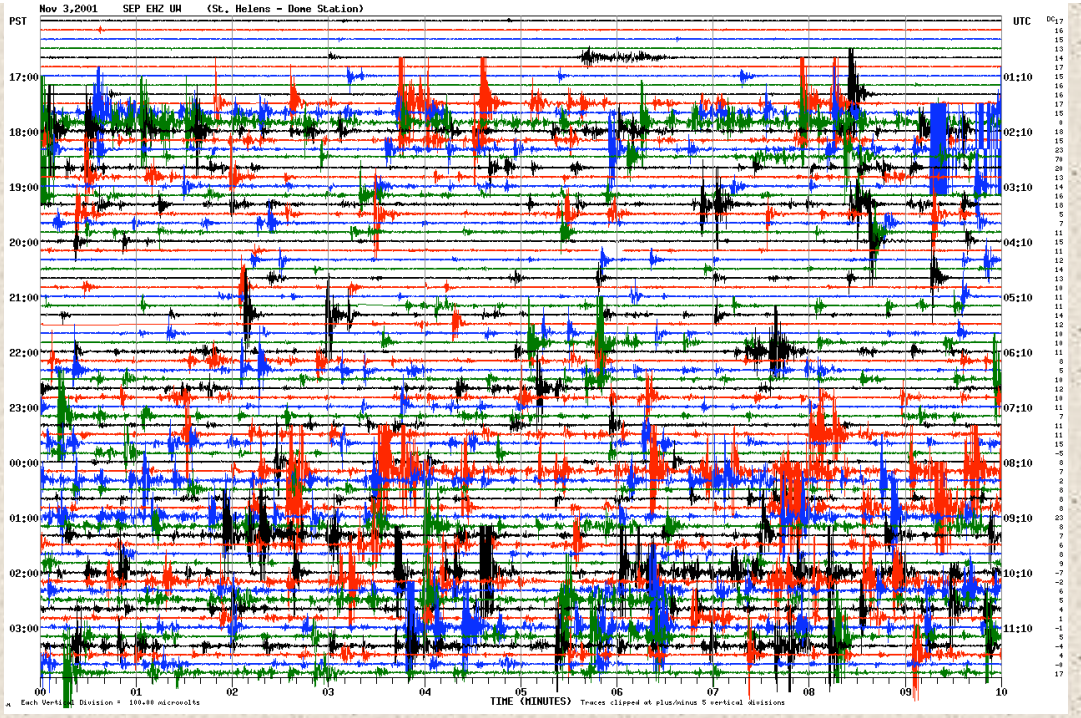
We watch volcanoes too, together with the USGS Cascade Volcano Observatory in Vancouver, WA.

The slow motions also are being monitored, although not yet in realtime.

GPS measurements of the direction & speed of the plate motions tell us where and how fast stresses are building up.

Near-Realtime Information Products

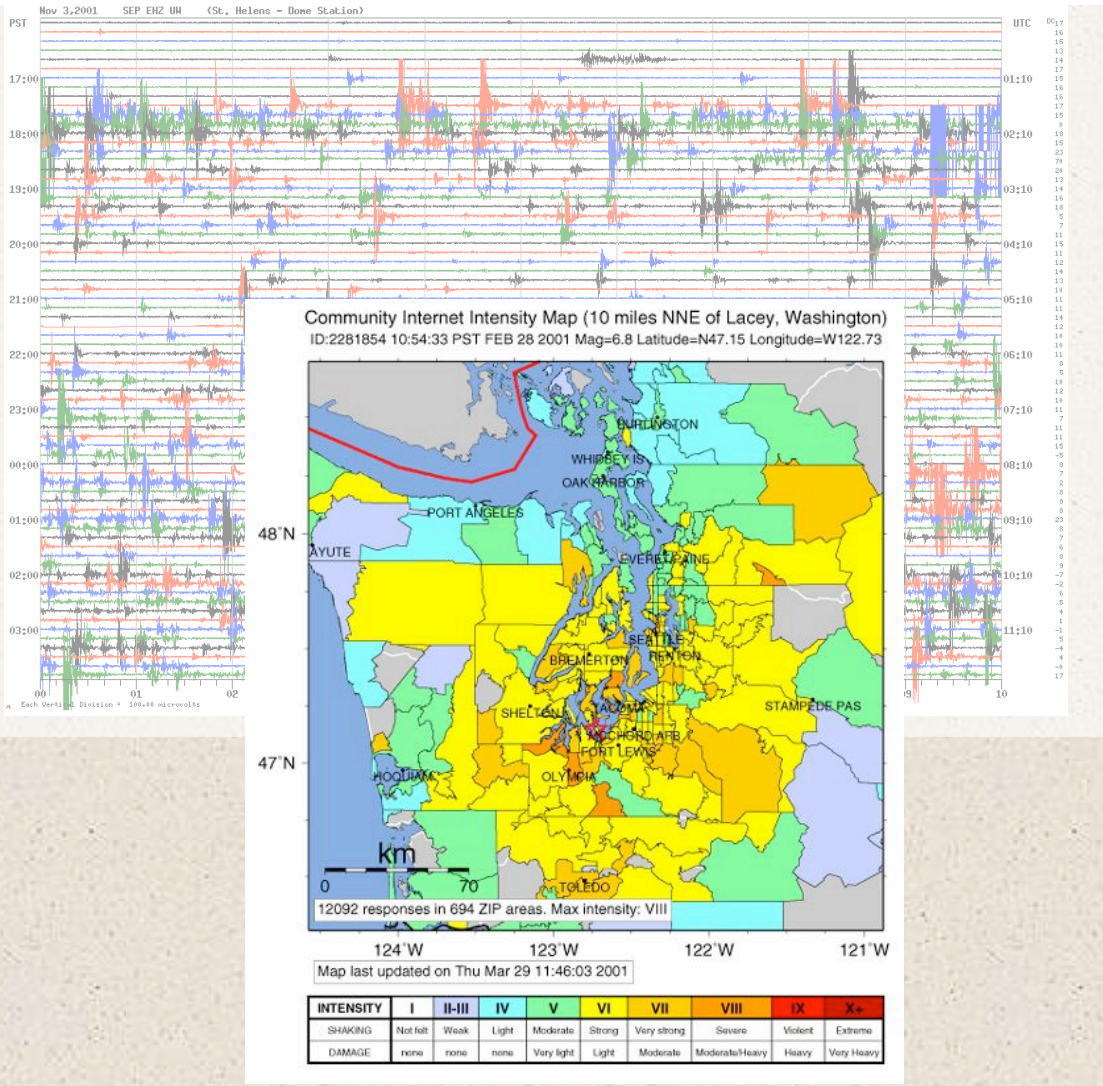
Seismograms



Near-Realtime Information Products

Seismograms

Community Internet Intensity Maps

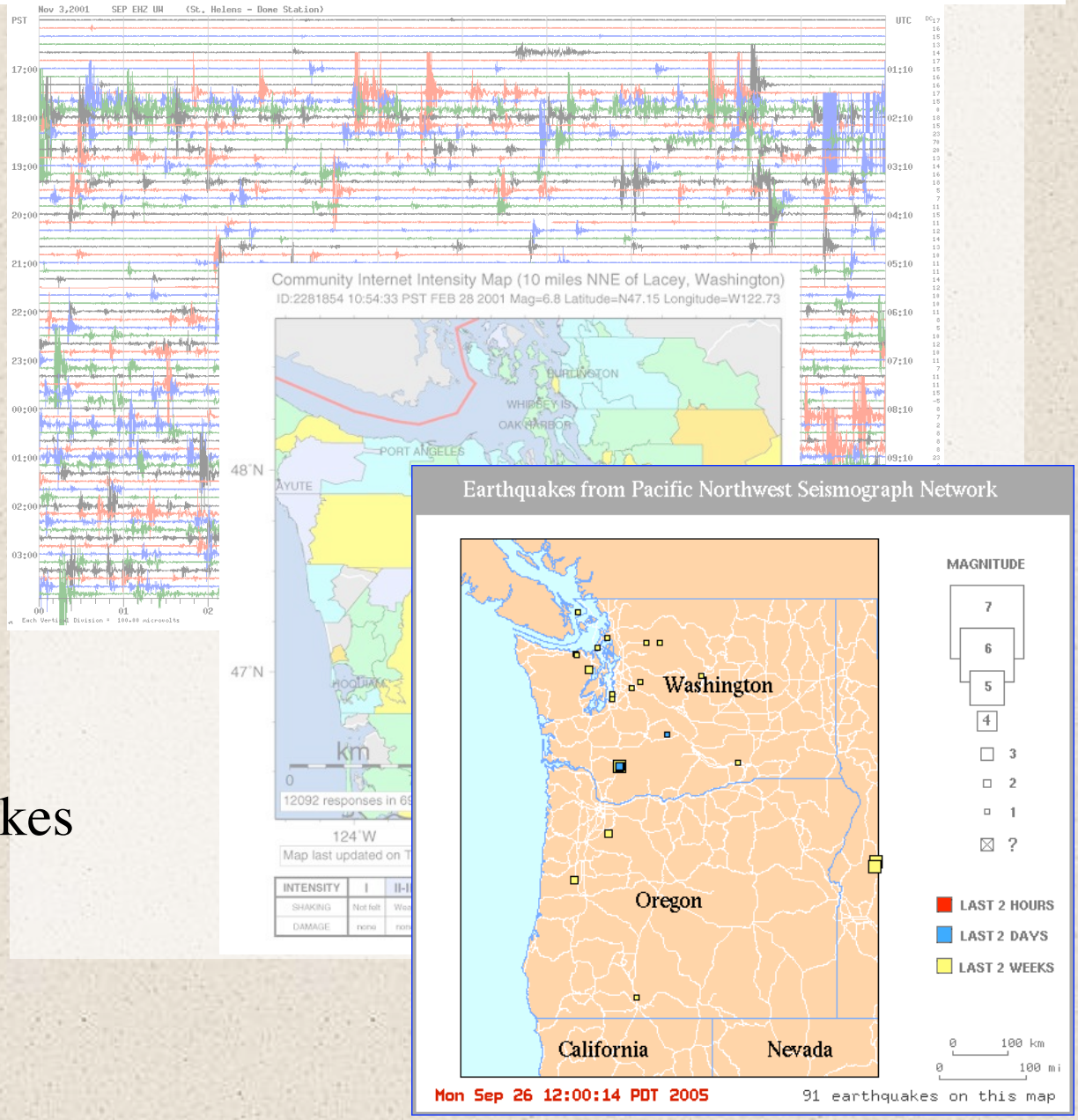


Near-Realtime Information Products

Seismograms

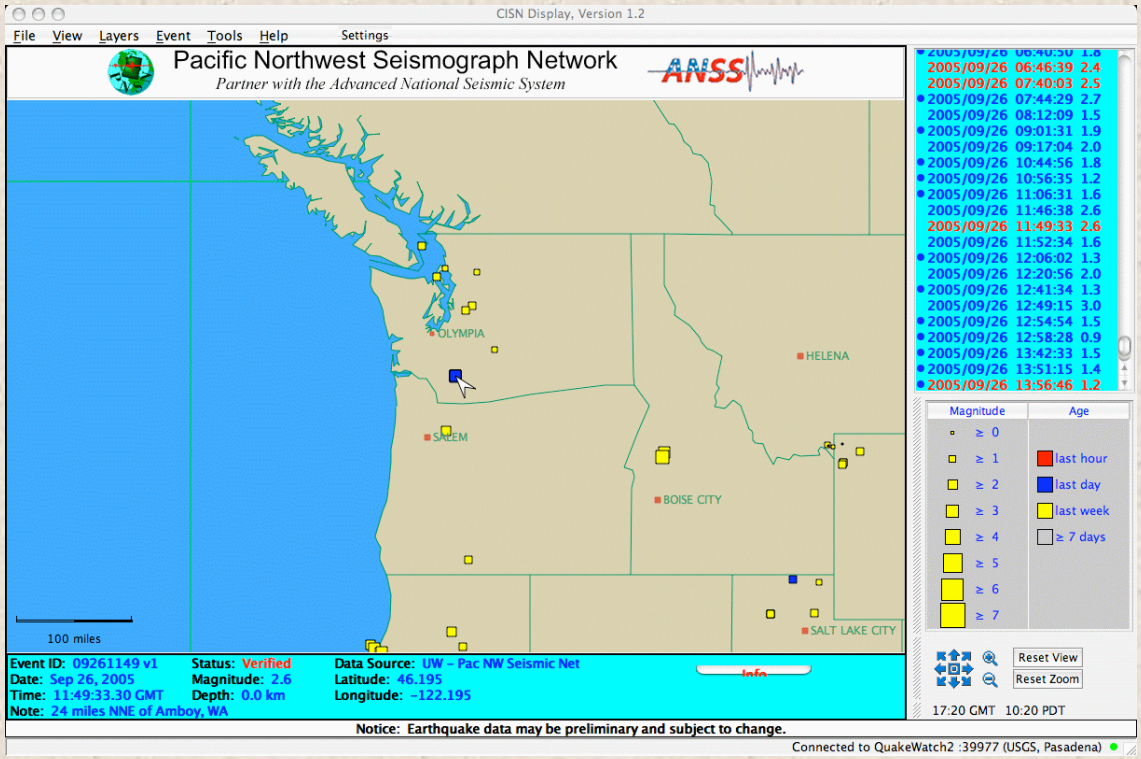
Community Internet Intensity Maps

Recent Earthquakes



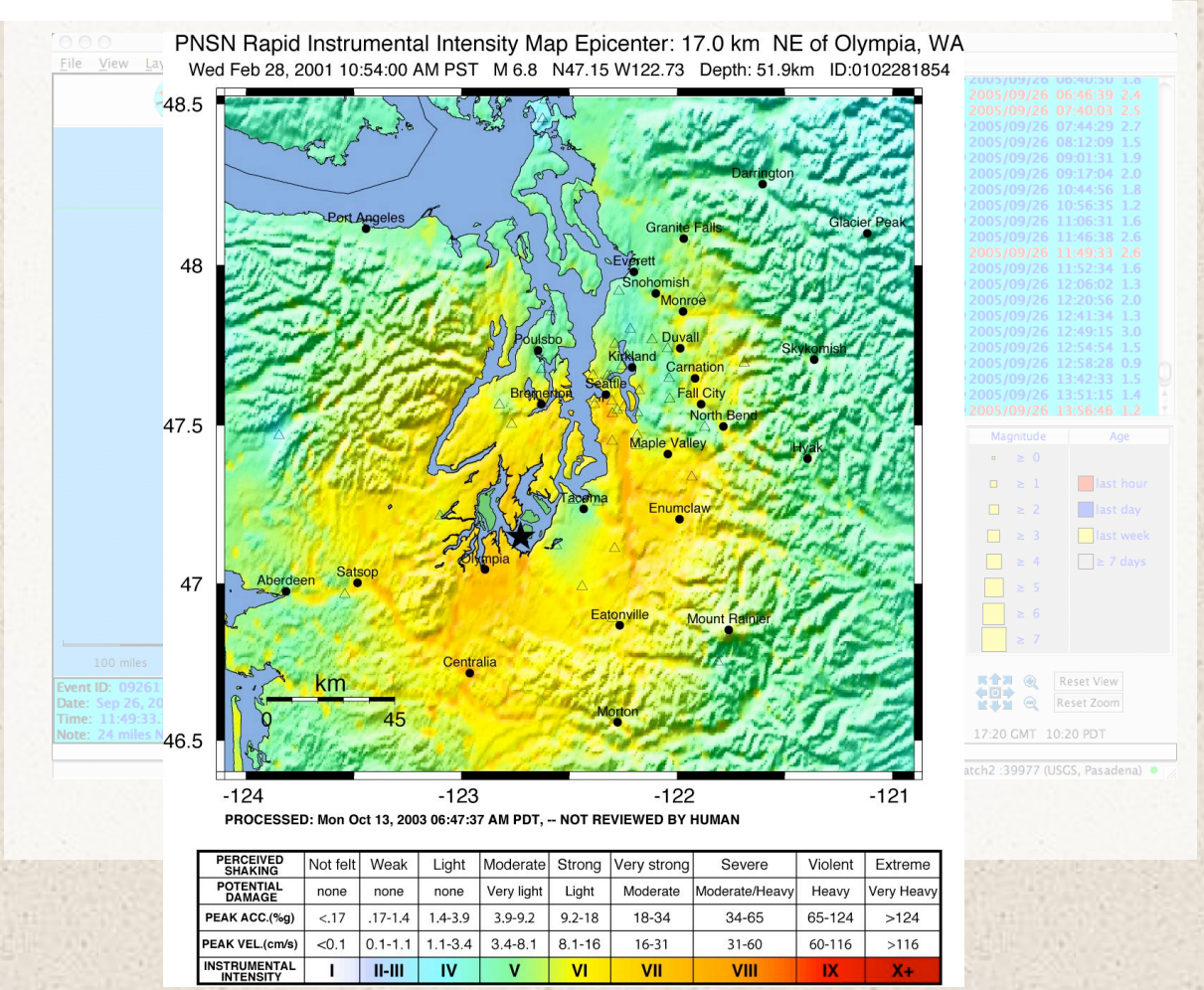
Near-Realtime Information Products

- Broadcast notification of earthquakes within ~7 minutes (CISN Display)



Near-Realtime Information Products

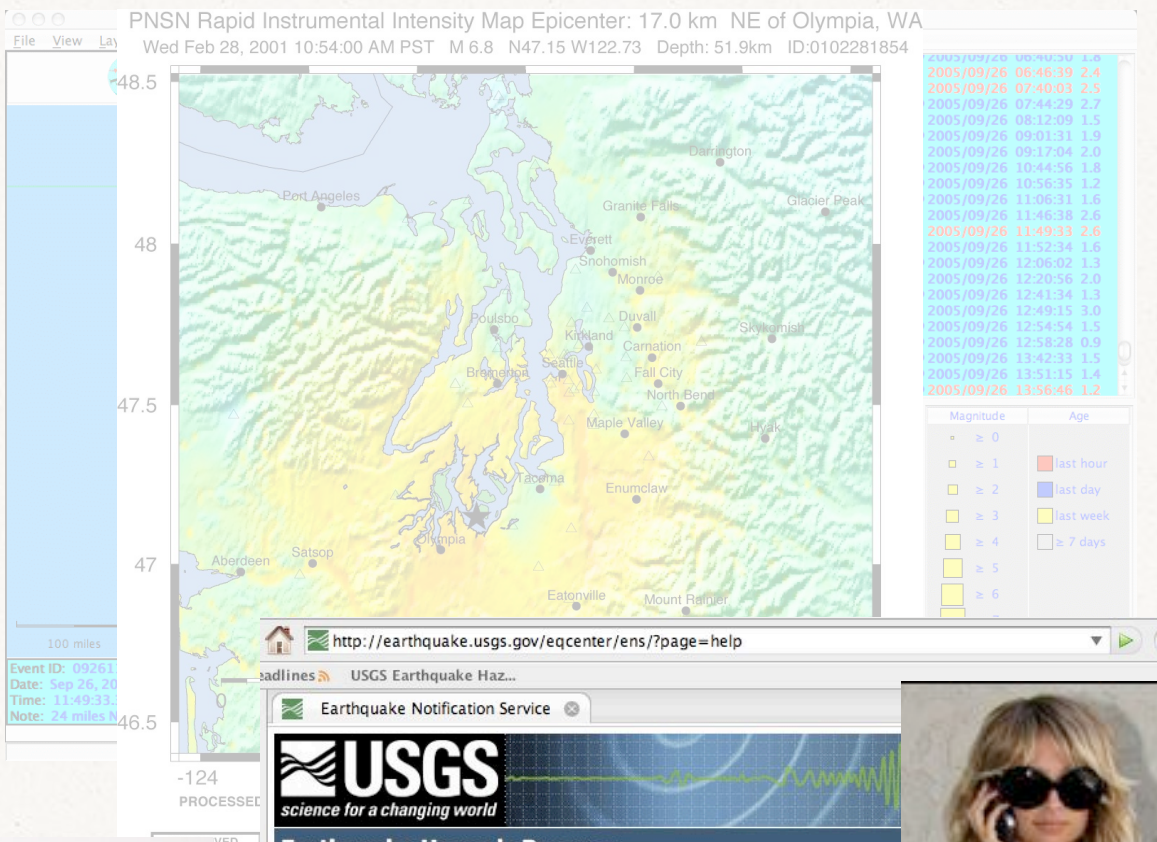
- Broadcast notification of earthquakes within ~7 minutes
- ShakeMaps

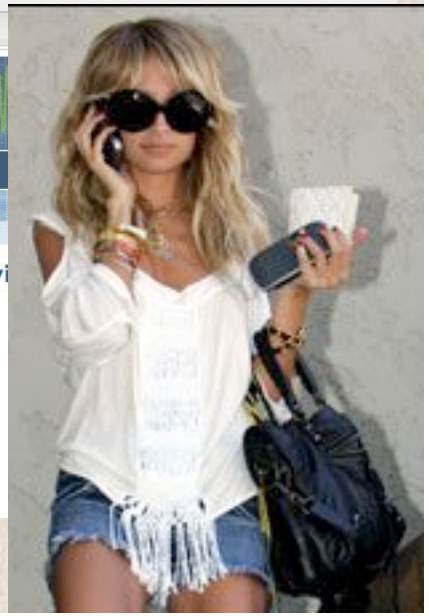


PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Near-Realtime Information Products

- Broadcast notification of earthquakes within ~10 minutes
- ShakeMaps
- A simpler option; the Earthquake Notification Service





Reports, Fact Sheets, Maps, Databases

Advanced National Seismic System

ANSS

ANSS CATALOG SEARCH

ANSS Catalog Home | Search | Maps and lists | Details | Caveats | Links

Use the form below to search the ANSS global earthquake catalog. Help with the form is available. Feel free to visit the earthquake maps and lists as well.

01/08/2003 - Try the simplified version of the catalog search with output maps!

Select earthquake catalog - Input dataset and output format

ANSS composite catalog (1898–present)

- (•) Catalog in readable format
- ( ) Readable 80-col format
- ( ) Raw catalog format

Select earthquake parameters

Start date,time: 2002/01/01,00:00:00

End date,time:

Min magnitude: 6.0 Max magnitude:

Min depth (km): Max depth (km):

Min latitude: Max latitude:

Min longitude: Max longitude:

Event Types: (•) Earthquakes ( ) Blasts (Quarry or Nuclear) ( ) All Events

☐ Include Events with no reported Magnitude

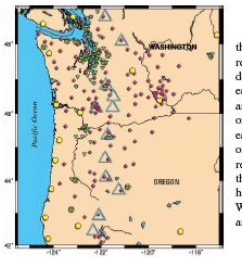
USGS science for a changing world

ANSS

THE ADVANCED NATIONAL SEISMIC SYSTEM REGIONAL NETWORKS

PNSN–Pacific Northwest Seismograph Network

The Pacific Northwest Seismograph Network (PNSN), an integral part of the Advanced National Seismic System (ANSS), locates earthquakes in Washington and Oregon and communicates earthquake information to the public.

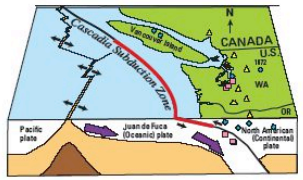


Each year, the PNSN records several dozen felt earthquakes and thousands of smaller earthquakes—ongoing reminders of the earthquake hazards in Washington and Oregon.

The Network: PNSN's Earthquake Monitoring Equipment uses several different types of sensors that measure ground motion: accelerometer ▽; seismometer (3 components) ✪; seismometer (1 component) ◆; Cascade volcanoes △.

Earthquakes in the Pacific Northwest

The Pacific Northwest (PNW) is an active seismic area with three distinct types of earthquakes. Major deep earthquakes recur every 30 years or so in western Washington. Subduction-zone earthquakes, which can be as large as magnitude 9.0 (M9.0), recur every few hundred years on a long offshore fault that parallels the coast of Washington and Oregon. Shallow crustal faults within the continental plate are a hazard to major urban centers from Seattle to Portland. Although recurrence times are not known, crustal earthquakes are a possibility almost anywhere in Washington and Oregon, including areas east of the Cascades such as Wenatchee, Yakima, and Walla Walla. Crustal earthquakes also precede volcanic outbursts and were used to predict eruptions at Mount St. Helens in the 1980s.



Deep earthquakes (40 miles below the Earth's surface) are within the subducting Oceanic plate as it bends beneath the Continental plate. The largest deep Northwest earthquakes known were in 1949 (M7.1), 1965 (M6.5), and 2001 (M6.8).

Shallow earthquakes (less than 15 miles deep) are caused by faults in the North American Continental plate. The Seattle fault produced a shallow magnitude 7+ earthquake 1,100 years ago. Other M7+ earthquakes occurred in 1872, 1918, and 1946.

Subduction earthquakes are huge quakes that result when the boundary between the Oceanic and Continental plates ruptures. In 1700, the most recent Cascadia Subduction Zone earthquake sent a tsunami as far as Japan.

Mount St. Helens/other Cascade volcanoes.

The PNSN

To monitor earthquake and volcanic activity across the Pacific Northwest, the University of Washington and the University of Oregon cooperatively operate the PNSN. Beginning in 1969 with five seismometers, the PNSN has grown to more than 200 seismograph stations distributed across the region. At the heart of the PNSN is an information and operations center, located at the University of Washington Department of Earth and Space Sciences, which provides rapid earthquake information to emergency responders, the press, and the public and high-quality data to engineers. The PNSN is sponsored by the U.S. Geological Survey (USGS), the U.S. Department of Energy, and the State of Washington.

Earthquake damage: engineers examine a lateral-spreading soil failure adjacent to Capitol Lake in Olympia, Washington, after the 2001 Nisqually earthquake. [Photograph by Pedro Arduino, University of Washington.]

U.S. Department of the Interior
U.S. Geological Survey

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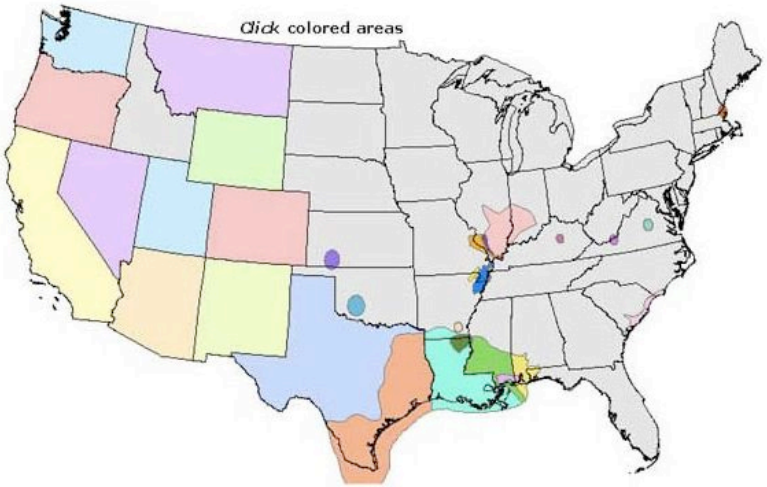
Fact Sheet 2004-3072
August 2004

Fault and Fold Database

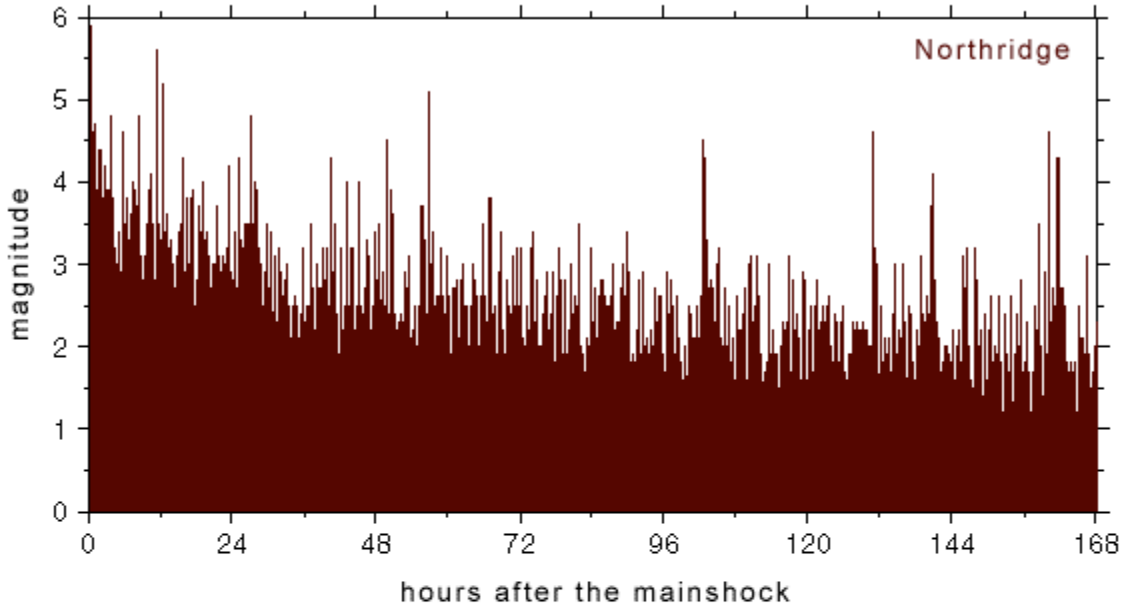
Home | Search the text database | US Map Help | Frequently asked questions | Download Data | Contributors | Glossary | Site Map

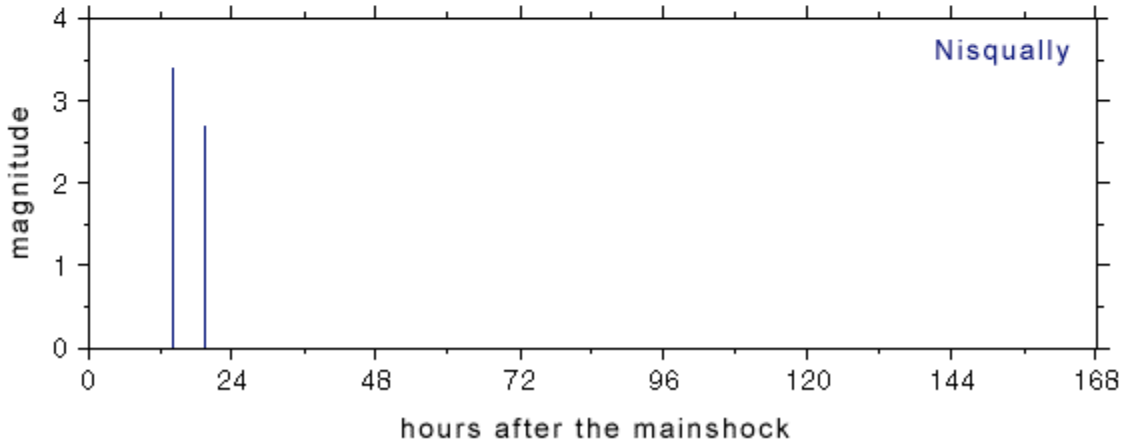
Faults and Folds by State and Region

Click colored areas



Soon - Aftershock Forecasts





Northridge Earthquake

100s of aftershocks

Largest – M5.9

Nisqually Earthquake

2 aftershocks

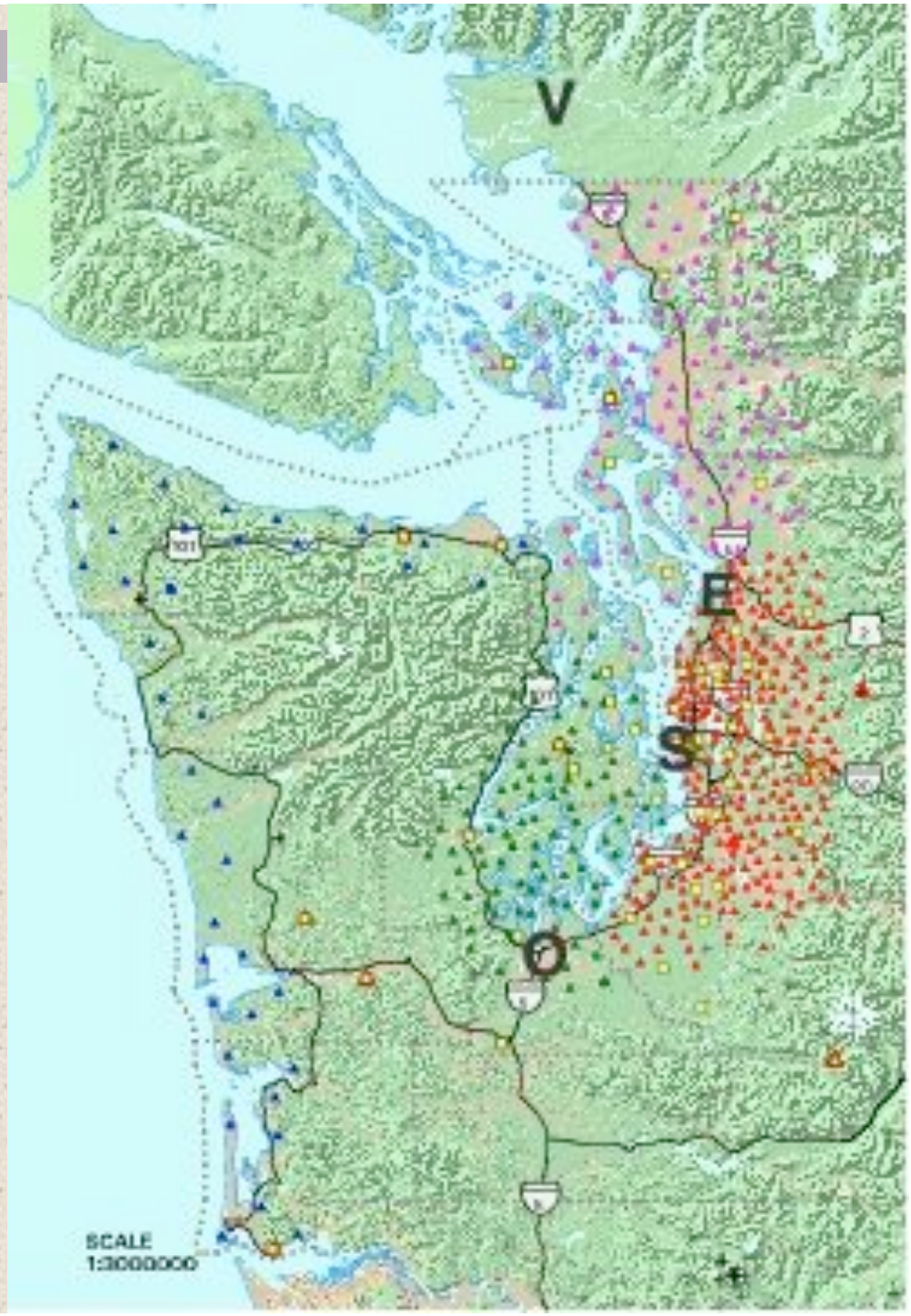
Largest – M3.4

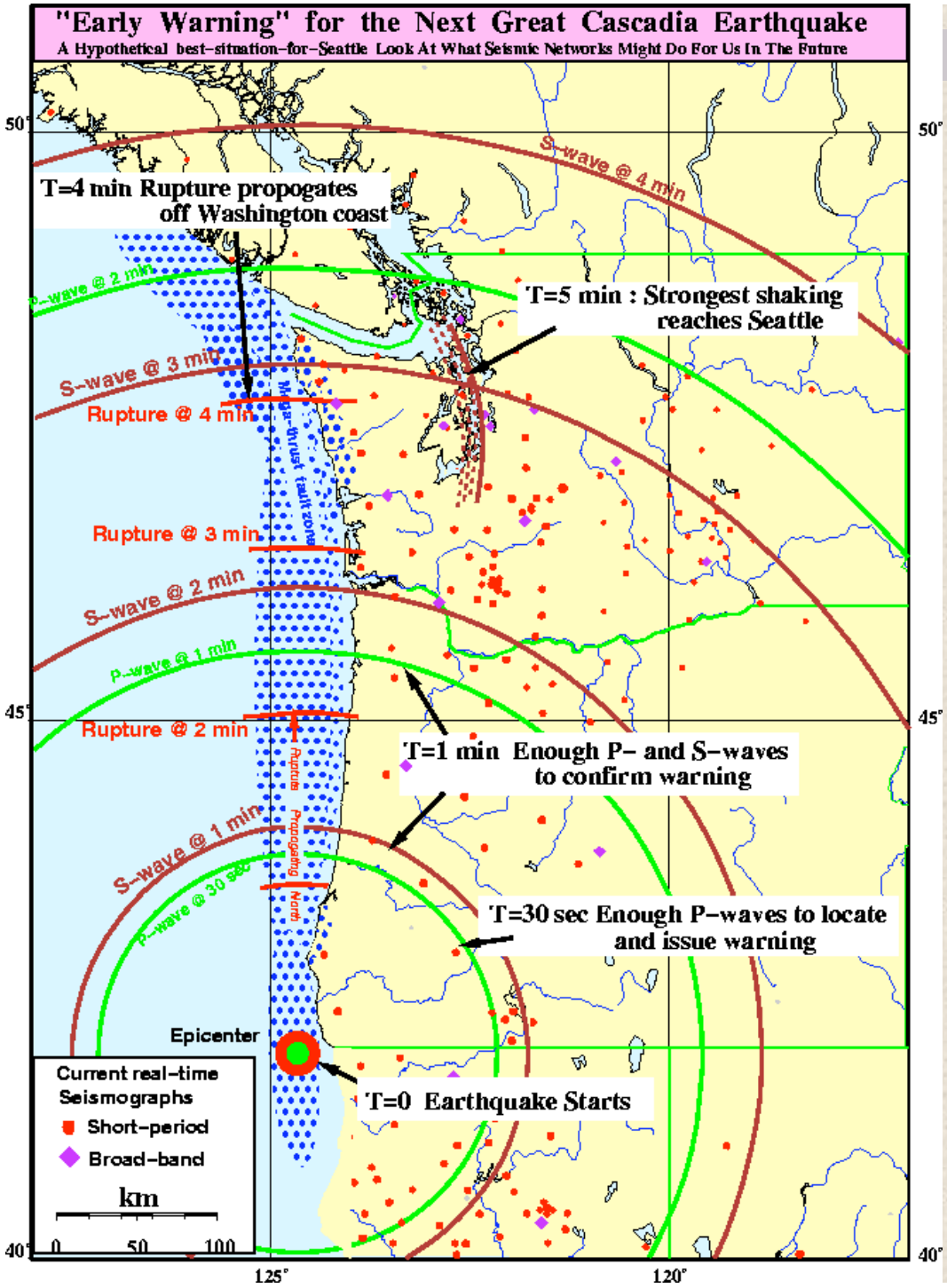
In a while

QuakeNet-

USGS plan to place 500 sensors on I-5 corridor -

highways, schools, hospitals, …





Eventually - Earthquake early warning

More information

PNSN
Pacific Northwest Seismic Network

- Poster of three earthquake source regions:
  - **http://geomaps.wr.usgs.gov/pacnw/pacnweq/casceq.html**
- Map of latest earthquakes:
  - **http://www.pnsn.org/recenteqs/latest.htm**
- Map of observed shaking:
  - **http://www.pnsn.org/shake/archive/**
- Community intensity maps:
  - **http://pasadena.wr.usgs.gov/shake/pnw/**
- Viewing seismograms (click on any station name):
  - **http://www.pnsn.org/WEBICORDER/webimaps.html**
- Enrolling in Earthquake Notification Service:
  - **http://earthquake.usgs.gov/eqcenter/ens/?page=help**
- PNSN home page (links to lots of info and detail):
  - **http://www.pnsn.org/welcome.html**

(On the handout)